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VIEWS, NEWS AND INTERVIEWS.

"Electric railway companies are resorting to many expedients to gain passengers these hot Summer evenings," remarked a traveler. "Down at Asbury Park the other night I saw an electric car full of passengers bowling along at a 20 mile an hour rate. On the rear platform was an organ-grinder with his organ giving selections from the latest operas and 'Sweet Marie.' The people in the car seemed to like the music and the people on the sidewalk experienced a curious feeling as the music approached in a crescendo and died away in a diminuendo as the car sped on."

A middle Georgia man recently smashed the globe of an arc lamp in order to light his pipe. He had never subscribed to a newspaper, but his funeral notice appeared in print just the same.

Different men come at things in different ways. It is reported of the illiterate country storekeeper who designated the sale of a cheese on credit by a circular sketch, and a grindstone by a similar sketch, with a square hole represented at the center, that he got pay for the articles just the same. We once, for some years, says the *American Machinist*, were on terms of intimacy with an engineer who was more than ordinarily noted for what he knew and what he produced, and the use he made, in arriving at conclusions, of inconsequential little machine products lying about loose on benches and around machines, while it mystified the beholder, seemed to guide him aright. It was his way of figuring, and it worked well.

There is a house on Bond street, in East Baltimore, Md., which the occupants believe to be bewitched. Harris Kotschiniosky and family and several tailors live there. They say that bright flashes and jets of electric fire burst from different parts of the house at unexpected moments. Where the currents come from and how they get into the house they do not know. The cause may undoubtedly be found in the friction caused by the names of the occupants of the house when speaking to one another.

Some of the most interesting work of the naval militia embarked aboard the cruisers "San Francisco" and "New York" was the signaling. Besides exchanging many messages with the Ardois system of signals on the night of July 23 the "San Francisco" turned on her search-lights. Immediately the "New York" followed suit, and the militia men were practiced in throwing beams of light from the great reflectors all around each ship, as if to detect any torpedo boat or other hostile craft that might try to approach the cruisers under cover of darkness. The feasibility of signaling from the men-of-war to distant stations on land and from there transmission to various other points was successfully established by the second division of the New York battalion from the "San Francisco," who established a station on Mount Prospect, Fisher's Island. The distance between the ship and the station was at least 18 miles, yet the search-light, thrown to the right or left, as a flag would be in the "wigwag" code, could be distinctly seen with the naked eye, and a message thus transmitted from the "New York" to the effect that the "Newark" had reported at Gray Head was easily read.

Said a locomotive engineer: "I wouldn't run the front end of one of those electric cars if you were to offer me $10 a day." When asked the reason why, he said it was too much of a strain on the nervous system to be so constantly on the watch in crowded streets. The uncertainty of the movements of children at play is a special cause for watchfulness, as they will often dart away from their playmates out in front of a car without the slightest warning or reason.

No Unsightly Poles in the Street, Mr. Dow.

City Engineer Dow, of Detroit, says the poles for the new municipal lighting plant are put in alleys whenever possible, but in many instances the alleys are either not opened through or are so full of jogs that their use is impracticable. In such instances the use of streets cannot be avoided. The Trumbull avenue line, and most of the others on the west side, he says, will be in the alleys.

If this is to be a model plant poles on the streets or alleys should be like the holes in Swiss cheese—invisible.

At the recent annual meeting of the Dedham, Mass., Electric Co., a six per cent dividend was declared and the following officers elected for the ensuing year: President, J. R. Bullard; treasurer, T. T. Robinson; Directors, Messrs. Bullard, Robinson, Judge F. D. Ely, Dr. J. W. Shea and F. B. Kingsbury.

FIG. 1.—DAVIDSON DIRECT CONNECTED RADIAL FAN, OPERATED BY LUNDELL MOTOR (NEW STYLE).

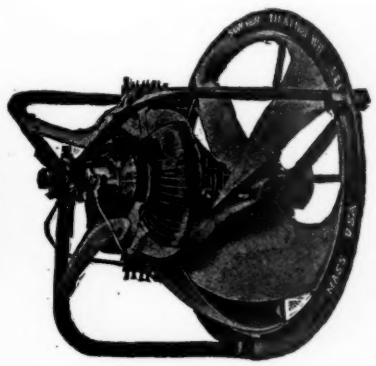


FIG. 2.—DAVIDSON DIRECT CONNECTED RADIAL FAN, OPERATED BY C. & C. MOTOR.

Davidson Ventilating Fan Company's Electrical Specialties.

During the past year the Davidson Ventilating Fan Company have been gradually making their way into the electrical field, until, at the present time, their spacious store, corner of Milk and Olive streets, Boston, makes a considerable show of electrical apparatus of various descriptions.

Their electrical department, which has now become an important factor in their business, is in charge of Mr. M. von Loesiche, part of whose long experience in electrical work was acquired with the old New England Brush Company and with the Thomson-Houston and General Electric Companies.

Among the specialties handled by the Davidson company in connection with their own system of ventilation, and of which they have secured the New England agency, are the Wenstrom dynamo, the Meston alternating fan motor, and the products of the Norwich Insulated Wire Company.

They are also special agents for the Lundell motors, of which they use a large number in connection with their radial fan, as shown in one of the illustrations herewith.

The Davidson company are doing considerable work in the way of electrical engineering and construction, and are now figuring on the equipment of some very large plants, both steam and electric, in the vicinity of Boston.

The most recent installation of importance is that in the new Exchange Club, of Boston, probably the finest club in size and equipment in the world. The entire system of ventilation was furnished by the Davidson company, through Mr. Frank B. Parsons, the general manager of the company, who is also a member of the club. Mr. Parsons is one of Boston's representative business men, and is universally popular, both in business and social circles.

The Edison Electric Illuminating Company, of New York, now supplies current to over 1,200 electric fans in New York city.

Tests of Lundell Fan Motors.

The following tests of Lundell fan motors were made by D. C. Durland and S. Townsend at the factory of the Interior Conduit and Insulation Company, New York city, on July 16. The motors were selected at random and it was thought that 12 of each size were a sufficient number from which to obtain a mean.

LUNDELL FAN MOTOR TEST.

No. 560

No.	Speed.	Volts.	Amperes.
1	1,700	115	.44
2	1,670	115	.44
3	1,780	114	.43
4	1,750	114	.44
5	1,800	115	.47
6	1,650	115	.44
7	1,730	115	.44
8	1,760	114.5	.47
9	1,710	114.5	.46
10	1,760	116	.46
11	1,760	116	.45
12	1,710	115.5	.44
Mean..	1,732	114.96	.44⅝

No. 562

No.	Speed.	Volts.	Amperes.
1	1,450	114.7	.86
2	1,410	114.5	.83
3	1,418	114	.87
4	1,466	114.5	.87
5	1,403	117	.81
6	1,440	115	.83
7	1,455	114	.87
8	1,410	113	.83
9	1,405	114.5	.85
10	1,405	115	.81
11	1,395	115	.86
12	1,408	115	.82
Mean..	1,422	114.7	.84¼

No. 568

No.	Speed.	Volts.	Amperes.
1	112	115.5	.98
2	120	116	.99
3	116	115	1.00
4	112	113	.98
5	112	114.5	1.00
6	116	114	.97
7	116	115	1.03
8	112	114.5	1.00
9	124	116	.98
10	116	115	1.02
11	122	115	1.05
12	116	115	1.00
Mean....	116.16	114.89	1.00

Fred. Gilbert Gets a Silver Service.

At a recent meeting of the Massachusetts Electric Lighting Association, there was presented to F. A. Gilbert, who has been president of the association for five years, a solid silver service, in acknowledgment of his valuable work for the association. The meeting was held at Hotel Pemberton, Hull, Mass. The following named were elected officers for the ensuing year: F. A. Gilbert, of Boston, president; T. C. Bates, of Worcester, and C. L. Edgar, of Boston, vice-presidents; H. F. Coggshall, of Fitchburg, James F. Almy, of Salem, Charles C. Fry, of Lynn, George R. Stetson, of New Bedford and Frank S. Richardson of North Adams, executive committee.

Fort Wayne News.

The order restraining the stockholders of the Fort Wayne Electric Company from holding their annual meeting has been continued until September 20.

J. H. Bunnell & Company's Electric Railway Specialties.

J. H. Bunnell & Company, 76 Cortlandt street, New York, are rapidly adding to their already large stock of standard and special apparatus and supplies for electric railway work. They have recently brought out the "Standard" trolley and a

Fig. 1.—J. H. Bunnell & Company's "Standard" Trolley.

new trolley wheel which have been highly indorsed. Both are shown in the accompanying illustrations.

The "Standard" trolley is claimed to be the best all-around trolley yet produced. The principal advantages claimed for it are small number of parts, simplicity, lightness, strength, positive contact at any angle from horizontal to perpendicular, and quick action, thereby lessening the probability of the trolley jumping the wire.

The trolley wheel has these claims made for it: Best shaped groove for wearing, durable metal of high conductivity and finest graphite bushing. This wheel is adapted to the "Standard" trolley fork.

Electricity and Earthquakes.

One of the greatest living authorities on earthquakes, Prof. John Milne, of the Japanese Imperial University, in a recent article in *The Seismological Magazine*, July, says that the results of experiments and investigations on a possible connection between earthquakes and magnetic and electric

Fig. 2.—J. H. Bunnell & Company's New Trolley Wheel.

phenomena do not allow us to admit any such connection. It is not likely that earthquakes ever result from electric disturbances, and it has not yet been proved that they ever give rise to any such, though when large masses of rock are displaced, as in Japan in 1891, slight local changes in magnetic curves have resulted.

TEST OF A CLOSED-COIL ARC DYNAMO.

READ BEFORE THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS, PHILADELPHIA, MAY 16, 1894, BY PROF. R. B. OWENS AND C. A. SKINNER.

That so much has been said and written concerning the design of constant potential machinery, effects of armature reactions, control of sparking, etc., and so little concerning the machinery used for arc lighting, seems rather remarkable considering the fact that by far the larger part of our outside lighting as well as much inside lighting is done by means of arc lamps in series, and I hope a discussion will follow in which more light will be thrown on the principles of design of arc machinery, for at present there seems to be much empiricism in the matter.

The immediate object of the present paper is to show something of the nature of the armature reactions, which occur in arc light machines of the closed-coil type, maintaining constant current by automatically shifting the brushes to correspond with changes in load in the external circuit, and to point out certain alterations in design, which it is believed may be adopted with advantage. Incidentally other points will be noted. Of course, there are other well-known methods of maintaining the current constant: Notably by shunting the field magnets as in the Brush machine, or a combination of this with shifting the brushes as in the new Excelsior machine, or by varying the length of time per revolution during which the armature coils are in series and shunt to each other, or short-circuited as in the Thomson-Houston machine, but these will not be considered at present. Nor is it intended here to discuss the relative advantages of the several types, but only to give some results obtained in a test of a closed-coil machine regulating as above mentioned. Such machines are now taking a prominent part in the arc lighting industry, and their prominence merits for them more close study. Alternating current dynamos, as the Westinghouse arc light machine, have been devised which keep the square root of the mean square of the current remarkably constant through extremely wide variations in load and without any external regulating mechanism whatever. They possess many advantages, but are not now widely used, for arc lamps seem as yet to work more satisfactorily on continuous current circuits. We believe it is also possible to build continuous current arc machines which, by armature reactions alone, can keep the current very nearly constant throughout a considerable range, but it would seem that their cost would be more and their efficiency less than in some of the types using an external regulating mechanism, although we have no exact comparative data.

The machine on which the following experiments were made is a No. 6 25 light 2,000 candle-power Wood arc dynamo, a scale drawing of which is shown in Fig. 1.

From the drawing all dimension as of magnet limbs, yoke pole pieces, armature, etc., are at once seen. Its designer, Mr. James J. Wood, most courteously consenting to my giving the name of the machine tested and its full data.

The winding data and other details as furnished by the makers are as follows:

The field magnet winding is composed of four coils of No. 10 Brown & Sharpe gauge copper wire single cotton covered. The outside diameter when insulated is 0.114 inch. Each coil contains 100 pounds of wire in 15 layers of 74 turns each.

The insulation of the magnet cores is one-eight inch thick, and composed of one layer of enameled cloth, the enameled surface facing the iron, the remainder being composed of pressboard 0.025 inch thick. The magnet heads are wooden washes ⅛ inch thick, carefully dried and shellaced.

The armature core is composed of No. 10 Brown & Sharpe gauge annealed charcoal iron wire. This is wound on a former which is removable, and is composed of 15 layers six and three-quarter inches wide. These wires are held together by interposed strips of linen tape. The core is then insulated with a layer of asbestos paper, three thickness of pressboard 0.15 inch thick, one layer of asbestos paper again, and then over this one more layer of pressboard 0.15 inch thick, making a smooth surface for the copper wires to be wound on. The insulations near the spider arms are built up of the same material and in the same manner as the armature core, until they attain a thickness of one-quarter inch. The armature is wound with 100 sections of No. 14 Brown & Sharpe gauge double covered cotton wire. Each section is composed of 93 feet, or 57 turns per section, making a total of 115 pounds of wire.

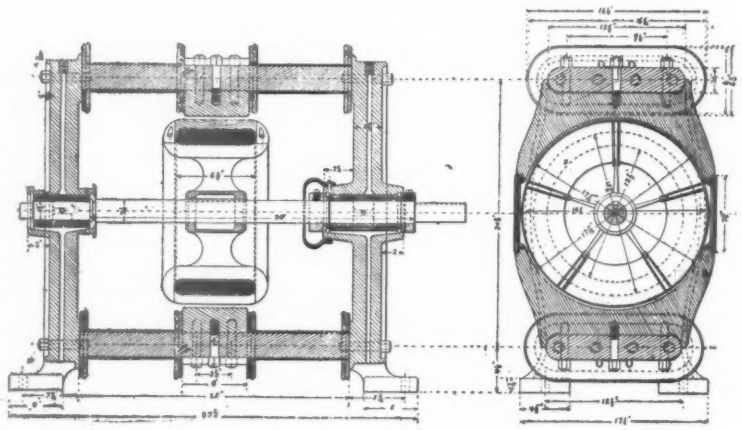


Fig. 1.

The regulator magnet is wound with No. 11 single cotton covered Brown & Sharpe gauge wire, in the manner shown on the dynamo. The insulation of the cores being ⅛ inch thick, and that of the magnet heads ⅛ inch. Speed of dynamo, 1,000 revolutions per minute.

CONDITIONS OF TEST.

The dynamo was securely bolted to a firm foundation of masonry, and driven through a seven inch belt by a small 8x10 inch high speed automatic Atlas engine making 250 revolutions per minute. Steam was supplied at as nearly constant pressure as possible.

The automatic regulator of the dynamo was removed together with one pair of opposite collecting brushes and the remaining pair reduced one-half in width parallel to the commutator bars, to allow of easier manipulation of the exploring brushes, their angular width being, of course, adjusted for each load to prevent sparking.

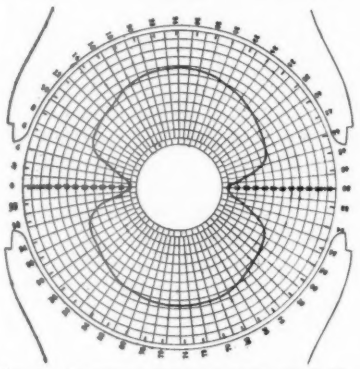


FIG 2.—SHOWING DISTRIBUTION OF E. M. F. WITH 10 AMPERES IN FIELD AND NO CURRENT IN ARMATURE.

It was at first attempted to use a number of arc lamps as load for the dynamo but though carefully adjusted and using cored carbons, the variations of potential and current due to their feeding was greater than could be admitted, so the lamps were discarded for two water rheostats 4x1x1 foot, with carbon electrodes. These latter on the whole were found to work quite satisfactorily, their resistance hot was considerably less than when cold, but it changed so gradually that no trouble was experienced in correcting for it by adjusting the electrodes.

The distribution of the induction entering the armature at different loads was obtained by taking the electro-motive force at various points on the commutator between two small pilot brushes moved around and in contact with it.

The two brush method, though somewhat more difficult to work than the single brush method, has the advantage over the latter of giving the quantities sought directly, instead of as a difference between quantities which are large as compared with those desired. In some cases the integral readings of the brush method have been plotted, but curves so obtained do not indicate so clearly what is mainly sought, namely, the distribution of lines of force entering the armature. True, one curve can be approximately obtained from the other if electro-static instruments are used, but not with electro-magnetic instruments, for they will give only a mean electro-motive force depending on the relative width of a commutator bar and insulation and distance apart of the pilot brushes. The results obtained, however, with a voltmeter

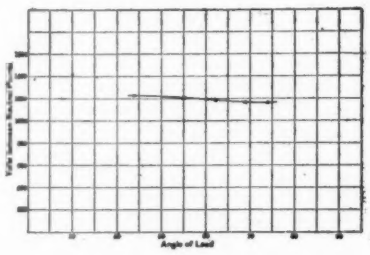


FIG. 8.

of the Weston type are proportional and for the present purpose are equally valuable.

The exploring brushes, as finally used, were pieces of steel watch springs firmly held in small fibre holders. These, in turn, were rigidly secured by brass studs to a graduated sliding ring, moving within another stationary ring, attached to and insulated from the dynamo frame and carefully centered with the commutator.

Two brushes were used in each holder to better insure good contact. Copper, brass and phosphor-bronze exploring brushes were tried at first but found not as satisfactory as steel. It was also found very necessary at all times to keep the brushes and commutator as clean as possible.

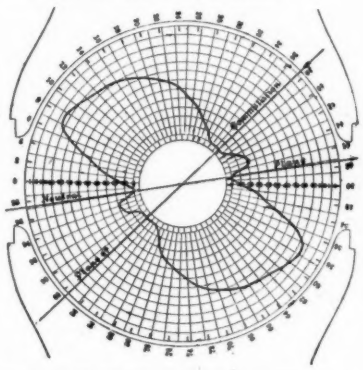


FIG. 3.—E. M. F. WITH 10 AMPERE CURRENT IN FIELD AND ARMATURE, 25 LIGHT POSITION.

The sliding ring was marked off into 100 divisions, the number of commutator segments, and the exploring brushes made to cover just two commutator bars or one fiftieth of the circumference, but the ring might have been divided into degrees if desired. The curves shown in figures 2, 3, 4, 5, 6 and 7 are plotted so that the results may be read either in degrees or in divisions of the graduated ring.

The inner circle representing the commutator of 100 segments and the 100 divisions of the ring are marked on the outer circle.

The radial lines are five degrees apart, and the radial distance between concentric circles represents 10 volts. If the results had been plotted on a developed diagram, then the areas of the curves would have represented total or integral electro-motive forces, but the circular diagram has the advantage of appealing more quickly to the eye, and though the total electro-motive force is not exactly represented by the area, it is proportional to the number of the small approximate rectangles enclosed. In obtaining efficiency measurements the power delivered to the dynamo was obtained by indicating the engine. The cards were taken with a Tabor indicator and worked up with a Coffin averaging instrument, the speed was obtained by a speed counter and stop watch. The electrical instruments used were a Weston 0.15 amperemeter for current measurements. A Weston 0.15 and 0.150 voltmeter for potentials between pilot brushes and a 0.150 and 0.1500 Weston voltmeter for total electro-motive forces. All instruments were previously calibrated.

RESULTS OBTAINED.

Fifteen sets of readings, 50 readings per set, were taken around the commutator with currents in armature and field of 8, 10 and 12 amperes, at positions of the collecting brushes approximately corresponding to loads of 5, 10, 15, 20 and 25 lights. Three sets of readings were also taken with currents in the field of 8, 10 and 12 amperes and no current in the armature. The results obtained are given in tables (not printed) and for a current of 10 amperes are plotted in corresponding plates.

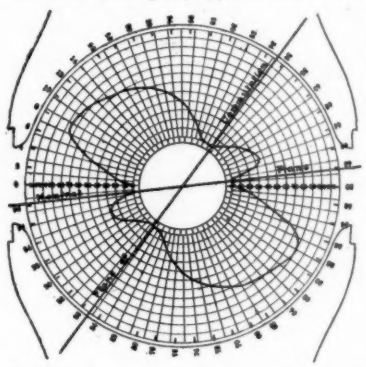


FIG. 4.—E. M. F. WITH 10 AMPERES IN FIELD AND ARMATURE, 20 LIGHT POSITION.

The reactions of the armature are so clearly shown by the curves that comment hardly seems necessary. Briefly, we see that the total induction in armature varies very slightly with lead and the displacement of the neutral plane decreases with lead angle but varies less than 10 degrees from no load to the maximum load used.

All electro-motive forces on one side of the neutral plane are of the same sign but differ in sign from those on the opposite side.

On a developed diagram the electro-motive forces between collecting brushes would be proportional to the difference between the whole area of

FIG. 5.—E. M. F. WITH 10 AMPERES IN FIELD AND ARMATURE, 15 LIGHT POSITION.

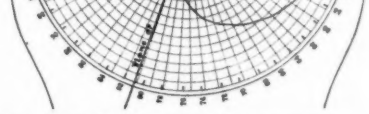


FIG. 6.—E. M. F. WITH 10 AMPERES IN FIELD AND ARMATURE, 10 LIGHT POSITION.

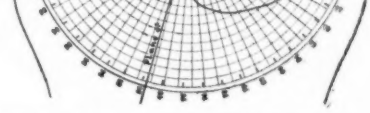


FIG. 7.—E. M. F. WITH 10 AMPERES IN FIELD AND ARMATURE, 5 LIGHT POSITION.

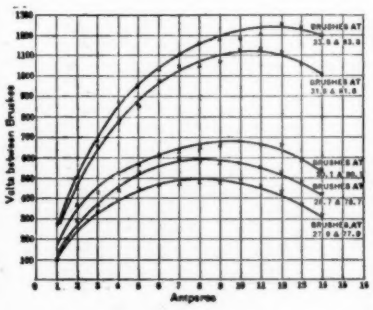


FIG. 9.

curve on one side of the line of commutation and the area of the curve included in the angle of lead, the lead angle being defined as the angular advance of the collecting brushes from the neutral plane. An inspection of the curve of total electro-motive force with angle of lead given in Fig. 6, shows that the electro-motive force between neutral points remains nearly constant as lead varies, which it is believed would not be the case if contracted polar faces were used instead of the extended ones as shown, for then the shifting of the field could not be so easily effected. Of course, a machine of the design tested with extended pole tips requires an automatic widening of the brush with increased load or independent control of sparking, but it would seem that the waste field at all loads would be less and its weight efficiency greater, or cost for a given output less than if its pole tips were cut away. Cutting away the pole tips or at least not extending them would have the advantage of allowing the use of collecting brushes of constant width within a certain range, but whether this advantage more than compensates for the decreased range of its output is open to question.

Regarding the relative amounts of iron in field and armature, we see no reason for the present practice of using so little iron in the armature, as compared with the field. The necessity of a very high field induction or a thoroughly stiff field is apparent; but why, when the lines are once generated by the field, is it not sought to collect and utilize them all by means of an armature, with a generous amount of iron, is not so easily seen. The number of commutator segments would, of course, have to be increased to prevent sparking, but the regulating qualities of the machine would, it is believed, not be impaired. The result would be a larger output and greater efficiency.

Regarding the ratio of ampere turns on field and armature, such ratio will depend largely on the shape of the pole pieces and desired width of brush, but is in all cases much less than in constant potential machines.

The characteristic curves shown in Fig. 9 were taken at the 5, 10, 15, 20 and 25 light positions of the brushes, and show that with this machine regulation is almost entirely effected by shifting the brushes, as the curves droop too slowly to assist to any material extent. Of course, they might have been made to droop much more rapidly if the collecting brushes had been moved into sparkless positions for each value of the current, but a curve so obtained is not at all a characteristic. The efficiency curve is given on Fig. 10. From this curve and from what we have seen of the machine it is evident that it would never pay to run machines of this type underloaded. If a number are used in one station the connections of the external circuits at the switch-board should be so manipulated as to

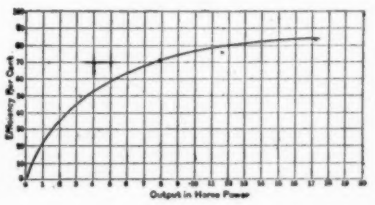


FIG. 10.

keep the machines actually in use always loaded to as near their full capacity as possible.

Postal Trolley Cars For Brooklyn.

Two postal cars were placed in operation on the Brooklyn trolley roads on August 8 and from now on will make regular trips between the various stations of that city. The system inaugurated by Postmaster Sullivan differs from that of other cities in that the mail will be distributed on the cars in the same manner as in postal cars on railroad lines.

It is the opinion of Postmaster Sullivan that the collection and the delivery of the mails will be expedited by several hours by the new system.

The two postal trolley cars are built on the same plan. They are painted white, with gold lettering. The interior of each car, which is 2[illegible] feet long, is divided into two compartments, each 10 feet long. One section of the car is arranged as a smoking room, with side seats.

The Post Office apartment resembles in the interior the ordinary postal car. There are frames for mail bags on one side, and on the opposite side is a wide table and a case of 40 pigeonholes, by means of which the mails are distributed.

Postmaster Sullivan will extend the system to the other trolley lines wherever opportunity presents itself. He would also like to have a drop box on every car on all the lines throughout the city, as the most of them pass the Post Office. By this means there would be a continuous collection of mail matter.

The first city to adopt an electric railway mail service was St. Louis. An interesting article on the St. Louis service, written by Postmaster John B. Harlow, appeared in the ELECTRICAL REVIEW for March 4, 1893.

Electric Power From Niagara Falls.

Mr. Frank W. Hawley, vice-president of the Cataract General Electric Company, which has the contract for stringing wires along the Erie canal from Buffalo to Albany, in order to furnish electric motor power for canal boats, said last week that about 20,000 horse-power would be brought into Buffalo from the Niagara Falls electric plant early in October next. The opening of the Buffalo-Niagara line will be made the occasion for a great public demonstration, both at Niagara and Buffalo. After that the construction of the lines east from Buffalo will be commenced. The company expects to reach Rochester with its power line, which will parallel the falls branch of the New York Central road by April 15 next. From Rochester the line will parallel the Auburn branch of the New York Central road to Canandaigua, Geneva, Seneca Falls and Auburn to Syracuse.

Queen & Company Make an Assignment.

Queen & Company, incorporated, of Philadelphia, have been compelled, owing to the business depression during last year and difficulty in making collections, to make an assignment without preferences to John G. Gray, manager of the firm. No statement of assets and liabilities has been issued by Queen & Company.

The Manufacture of Armature Disks.

The three accompanying cuts show some improved machinery made by the E. W. Bliss Company, of Brooklyn, N. Y. They are largely used in the making of armature disks for electrical machines. Fig. 1 represents a No. 95 double pitman press, and is used for blanking out rings for

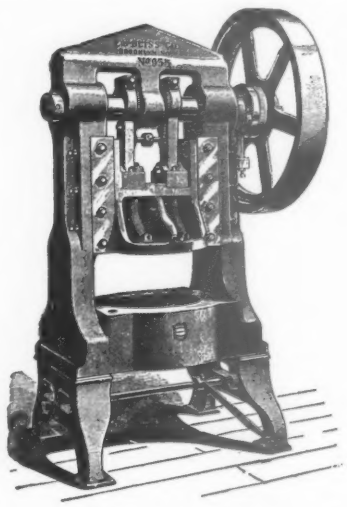


FIG. 1.—BLISS NO. 95 DOUBLE PITMAN PRESS.

disks, which is usually done in a combined double die cutting the inside and outside ring at the same stroke; this leaves a plain ring ready for the No. 61 notching machine represented by Fig. 2.

There are some firms who punch the notches in the disks at the same stroke that the center is cut, by this method making a complete notched ring at every stroke of the press. This method, however, calls for such fine delicate dies, which are so expensive that it is not of general use, it being much cheaper to make the plain punched ring and then put it in the No. 61 press.

This press has an accurate dial feed carrying the blank under the notching die and cutting from one to six notches at a time, as may be desired.

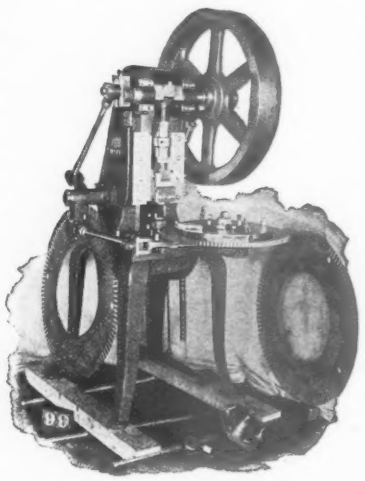


FIG. 2.—BLISS NO. 61 NOTCHING MACHINE.

The disk is easily placed in position and held by adjustable clamps. After the notching is done the disk is easily removed. This press can also be arranged so that as the last notch is punched it will stop itself automatically. It is adjustable to different diameters, ranging from 12 up to 48 inches; all its motions are well designed for their purpose and all the working parts are accessible and in sight. There are a large number of these machines now in practicable use and giving the best of satisfaction.

The smaller machine (Fig. 3) is of recent design and is intended for rolling down the burrs sometimes caused by the wear of the dies and punches, thus leaving a slight roughness on the blanks punched. After such blanks or sections are passed between the rolls they are quite smooth and will lay close to each other and pack tightly when used in a dynamo or other machine.

This rolling machine has all the needed adjustments, etc., that are necessary for the proper performance of its work. Of course, there are considerably larger machines used in this work, but this is the most popular size.

Another Primary Battery Fiend Exposed.

TO THE EDITOR OF ELECTRICAL REVIEW:

A man at Oakland, Cal., has devised a plan for generating electricity by connecting zinc and copper plates of large size, buried in the ground and pouring diluted sulphuric acid around them. He burns a few incandescent lights, etc., and has succeeded in collecting several thousand dollars from investors, notwithstanding his system has been experted by electricians and condemned; and this financial aid is still being sought.

The scheme was recently brought to the attention of an attorney in San Francisco who was delighted with its novelty and simplicity, but asked an electrical friend to look into it before parting with his coin. I enclose a copy of his electrical friend's report.

Yours truly,
S. W. WARD.

San Francisco, August 1, 1894.

REPORT.

The most primitive and expensive method of deve oping electricity was by decomposition of zinc. The feeble curren's first obtained by Volta, away back in the dawn of the art, were generated in this way, and this blockhead, with all the ignorance of a Patagonian or a Pelican, has gone back a hundred years and started in at the beginning again. Furthermore, his methods are even more wasteful than the experimental discovery of the fluid.

Capable men have examined his process, have explained to him, in a kindly way, his dense idiocy and proven by actual figures the utter fallacy of all his claims; but no single ray of reason seems to have penetrated his brain. The most singular feature of this proposition is that men of ordinary intelligence will allow themselves to be duped, when an elementary primer would show their stupidity.

Write to the Western Union Telegraph Company, New York.

TO THE EDITOR OF ELECTRICAL REVIEW:

DEAR SIR—Can you advise me where I can get quotations on the several printing telegraphs now in use by brokers, etc.?

Yours very truly,
H. M. FERGUSON.

New York, August 4, 1894.

G. W. Buck and Levi Wilcutts have asked for a franchise to construct and operate an automatic telephone exchange system at Duluth, Minn.

An Electrically Heated Quilt.

A new invention, called by its inventor the thermogen, consists of a quilt containing a coil of wire bent in the fashion of a gridiron, inclosed in insulating and non-conducting material, and embedded in cotton-wool or other soft substance with a silk or woolen covering. The resistance offered by the coil to the flow of an electric current through the wire produces heat in the same way that heat and eventually light are produced in the filament of the glow-lamp. A uniform temperature of about 150 degrees Fahrenheit is thus maintained, but in the event of the temperature rising beyond that point from increase of pressure in the electric mains, a fuse instantly melts and automatically shuts off the current. The quilt may be readily attached to ordinary incandescent lamp terminals. In describing this device London *Lancet* says that the most important medical use of such an invention would be on the operating table, where, in lengthened operations or in those attended with hemorrhage, where artificial means to sustain the patient's temperature are required, blankets and hot water are a decided nuisance. In such cases this quilt

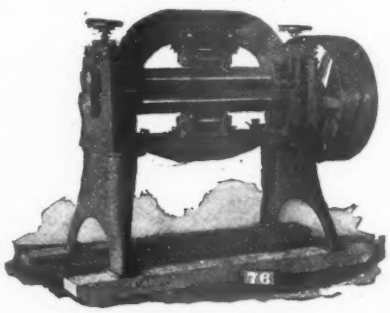


FIG. 3.—BLISS ROLLING MACHINE.

would be invaluable as a soft, dry, warm and convenient covering. Again, in cases of chronic rheumatism, lumbago or senile slowness of circulation, such an appliance would be useful. The thermogen is now receiving trial at several large English hospitals.

Hawaii Not To Be a Cable Terminus.

It appears from an official statement, issued by the Canadian Government, that it has been decided to abandon Hawaii as a port for the landing of the Canadian-Australian Pacific cable. Tenders are invited for seven different routes and upon three different plans, viz: Plan No. 1 invites tenders for the construction of a cable to be the property of the government, but to be guaranteed by the construction company.

Plan No. 2, for a cable to be run by a company undertaking the work under the basis of a subsidy, the tender to stipulate the amount of the subsidy required and the number of years for which it will be operated.

The third plan calls for the tender for the construction and operation of a cable for a stipulated guarantee of earnings to be made by the companies tendering. The parties tendering are asked in each case to tender for seven different routes under the three separate plans mentioned, the government to regulate the amount of tolls to be charged by an order in council.

Improvements at the Narragansett Company's Station, Providence, R. I.

Considerable new work at the plant of the Narragansett Electric Lighting Company, Providence, R. I., is now in progress and the expectation is that it will be completed by September 1, giving greatly increased capacity to the station. There is to be a new building located on the south side of the east end of the old structure. The addition is to be 117 feet, eight inches, by 45 feet, a spacious single story structure and built entirely of steel and glass. The foundation is now near completion and consists of 43 spruce piles driven to a level and covered with 30 inches of concrete made of the best Portland cement. The masonry will rise but one foot above the street level and from that point up the steel and glass is to be used exclusively. The Berlin Iron Bridge Company, of East Berlin, Conn., will build the superstructure.

The increase in the plant itself is to comprise three new engines, three generators, two additional batteries of boilers and an independent vertical condenser and pump. The generators are to be of 750 horse-power each, two of them attached directly to the engine shafts for furnishing power for factories, elevators, etc., and the third for additional incandescent service. The engines will be of 1,000 horse-power each. Of the six old engines, one is to be removed and the big No. 1 triple expansion engine of 1,600 horse-power is to be renovated, so that after September 1 there will be eight engines in operation with an aggregate horse-power of 9,000, or in detail two of 1,600 each, five of 1,000 each and one of 800.

The water tube boilers will be supplied by the National Boiler Company, of New Brunswick, N. J. Over 300 men are employed in this work, and they are divided into gangs working 24 hours a day.

General Manager John J. Moore, who has put plants in operation all over the country, and who is a veteran electrical engineer, pays a splendid tribute to Marsden J. Perry's foresight and shrewdness, as indicated in the perfection of the plant. The demand for electricity in all its various uses is rapidly increasing, and the Narragansett Electric Lighting Company is prepared to meet it.

The present work is divided up as follows: The whole is under the personal supervision of Mr. Moore, assisted by Chief Engineer F. N. Bushnell and Superintendent Van Thomas. All of the electrical work is done by the employés of the company and the architectural designs are also furnished at the power station.

OBITUARY.

Thomas M. Sayre, well known to street railway men, died recently in Jersey City, N. J. He entered the service of the Jersey City horse car company in 1859 and advanced, step by step, until at his death he was superintendent of the Consolidated Traction Company in Jersey City.

A Small Marine Generating Plant.

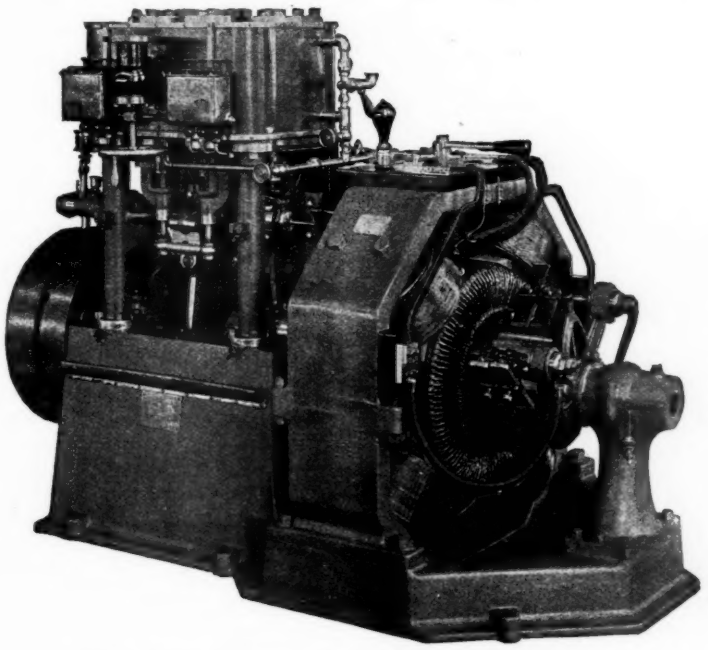
The illumination of vessels by electricity instead of the smoky oil lamp has so rapidly extended that it may be said there is hardly a steamship, which has a due respect for the place it occupies in Nature's scheme, which is not equipped with an electric lighting plant. This is partly due to the example set on land, but mainly to the fact that the apparatus to fulfill the requirements of marine service and cope with the conditions which obtain on board ship, has reached a high degree of perfection. We illustrate a small marine generating plant which is demonstrative of this fact and which has only recently been placed on the market by the General Electric Company.

The engine of the combination is of the automatic cut-off type, double and vertical, and is rated on a basis of 80 pounds initial steam pressure, one-quarter cut-off. This leaves a liberal reserve capacity above the rating given, and the engine can be run under any steam pressure between 60 and 100 pounds. All the parts are accurately cut, so that in case of necessary repairs in fitting delay is avoided. All bearing surfaces are carefully fitted and flat surfaces scraped to surface plates. The crank shaft is of hammered Bessemer steel made in one piece, while the connecting rod is of forged steel with babbitted boxes. The cross head is of a crucible steel casting, with babbitted wearing surfaces and the main bearings are provided with interchangeable babbitted cast-iron boxes and are of extra length.

The dynamo is well protected with oil guards, and guards are furnished for all places where oil is liable to be thrown. The oiling arrangement is such that the engine may be run continuously without stop, and the bed is so constructed that all the waste oil is collected in one pit from which it may be drawn, strained and again used. The governor is of very simple construction, its parts are readily accessible and are always in sight. All those parts of the combination subject to wear are made of hardened tool steel.

The variation in speed from extreme light load to the full capacity of the dynamo does not exceed four per cent, and full load may be thrown on or off with not more than four per cent increase or decrease in the speed. The connection between the engine and dynamo is made through a solid flange coupling especially constructed for a ready and easy disconnection of the armature. The armature is of the smooth body type and the entire load may be thrown on without shifting the brushes and without sparking. The sets are built in four sizes, 15, 30, 40 and 50 kilowatts.

These combinations, while primarily intended for marine work, are also especially adapted for isolated plants in hotels, theaters, office buildings, etc., and all the qualities which characterize them will be found equally advantageous whether the plant be on land or aboard a ship.



General Electric Company's Small Marine Generating Plant.

Sale of Royal Arc Electric Company's Patents for $500.

In our last issue announcement was made of the appointment of a receiver for the Royal Arc Electric Company, U. S. A. On August 8, at Taylor's Hotel, Jersey City, at receiver's sale, the patents owned and controlled by the Royal Arc Electric Company were sold for the sum of $500, the purchaser being Mr. Jas. I. Ayer. But one bid was received, Mr. Ayer's. It is probable that a reorganization will take place to exploit the patents of this company.

At the annual meeting of the Nashua, N. H., Light, Heat and Power Company, July 26, the following officers were elected: Fred. W. Estabrook, Edward Spalding, James H. Tolles, Frank E. Anderson and George E. Anderson were elected directors; James H. Tolles, clerk of corporation. Following the meeting of the stockholders the directors organized by the election of F. W. Estabrook as president and James H. Tolles secretary of the board.

ELECTRIC RAILWAY NOTES.

A new electric road from Marion to Port Clinton through Tiffin, Upper Sandusky and Fremont, Ohio, is contemplated.

The project to connect Warren, Sharon, Hubbard and Youngstown, Ohio, by electric railway has been abandoned for the present.

The Attleboro, North Attleboro and Wrentham street railroad has passed into the hands of the Union Traction Company, of Providence, R. I.

The Common Council has granted a franchise to the North and South Railroad Company to build an electric surface railroad through Yonkers, N. Y.

The Milwaukee, Wis., Street Railway Company has taken the matter of the assessment of its franchise into court. The matter will come before the courts in September.

The street railroad war between the Akron, Ohio, Street Railway Company and Akron and Cuyahoga Falls Rapid Transit Company has resulted in favor of the former, all injunctions being peremptorily ordered off.

Public interest in the construction of trolley railroads in the counties of Maryland is significantly on the increase. Within six months about 20 public meetings have been held in various parts of the State to discuss the problem in general and to consider specific projects.

An electric railroad is to be built at once between Asbury Park and Branchport, N. J., to connect with the steamboat at the latter place running to New York daily. The leaders of the scheme are Senator James A. Bradley and H. C. King, and the eight miles of tracks and overhead wire will probably be in position by next Fall.

A unique trolley car fender is proposed by a Boston inventor. He has taken the large revolving brushes from a street sweeper and placed them in such a position under the car so that a person who happens to fall in front of the car will be practically swept from the track. The brushes are geared to the axle of the car so that they will revolve as the car moves along. Their position is much the same as that of a cow-catcher—that is, in the shape of a V, with the point ahead.

Three street railways at Tiffin, Ohio, which are embraced in the Tiffin and Intersuburban Consolidated Railroad Company have passed into the hands of Meshech Frost as receiver. The assets are $150,000 and the liabilities will likely exceed that figure. The appointment of a receiver was made by Judge Norris at the suit of the Cambria Iron Company to secure a claim for $5,000, but this was merely a form, as the Consolidated, since it failed to float its $300,000 of bonds in New York city, is hopelessly involved and the only way out of the difficulty is the sale of all its roads.

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"Flames shot from the power box" is the way a slight blaze in a Brooklyn trolley car was described in several New York daily papers. What's a power box? Can it be the motor?

There has not been a Summer since the commercial introduction of the electric fan motor when that ingenious device has been more appreciated than during the present season. The fan motor has made many new friends.

In another column will be found an account of the doings of the latest primary battery fraud. This man, it seems, has been kindly reasoned with but to no purpose. Perhaps his density on the battery question is due to his belief in that old adage about a certain class of people and their money.

THE ELECTRICAL REVIEW does not often speak out politically, but on this occasion begs the privilege of remarking that Col. Stephen Van Rensselaer Cruger would make an admirable and, we think, successful candidate for Mayor of New York city. So would Joseph H. Choate, for Governor.

This is the critical and hysterical season in base-ball matters. The daily newspaper reporters, in order to catch the fancy of enthusiastic "rooters," are often put to it about this time of year for new phrases of praise and condemnation for the several teams and their individual players. The now familiar slang phrase "he has wheels in his head" must have grown tiresome to a certain baseball reporter for he has entered the realms of electricity to acquire a more up to date expression of contumely. He says a Mr. Tommy Tucker appeared to play ball at Eastern Park, Brooklyn, N. Y., one afternoon last week "and the electric fan in his head was running with unusual rapidity." Thus another electrical term has entered into popular use as slang and now stands together with "your trolley's off" and "live wire" which we have already noted in these columns.

The Allegheny County Medical Society is having a bill prepared to be introduced at the next session of the Pennsylvania Legislature which is to make provision for the execution of criminals by poison. The doctors profess to have been considering the matter, and have come to the conclusion that poison is the surest and easiest means of death that can be found. These disciples of Esculapius discard hanging as brutal and barbarous and turn down electricity as "uncertain and a slow means of death." They are right and they have the opinion of an eminent French authority to back them up. Who can positively affirm that the many criminals electrocuted in New York State were dead before the post mortem examinations began? Success to the bill. Let not the great Keystone State defile her statute books as New York has done with an inhuman electrocution law.

THE INVENTOR OF THE ELECTRIC FAN MOTOR.

The discussion as to the inventor of that invaluable device, the electric fan motor, which was recently started in the ELECTRICAL REVIEW, is causing quite a little interest. The records in the matter at the Patent Office were published in the ELECTRICAL REVIEW for July 25, 1894. Mr. C. J. Kintner and Mr. A. P. Shaw both discovered two patents, one granted in 1854 to L. Stein, and the other granted in 1868 to C. T. Mason for the application of a rotary fan directly to the armature shaft of an electric motor.

Now comes Mr. E. H. Johnson, president of the Interior Conduit and Insulation Company, who claims in one of our contemporaries that he made electric fan motors in the Winter of 1882-3. His assertion is backed up by Mr. S. Bergmann. Dr. Schuyler S. Wheeler placed his date as 1886. Mr. Johnson has gone further back than Dr. Wheeler, but he seems to have ignored Messrs. Stein and Mason.

Let the good work go on. By a process of natural selection we may get back to the times of Stein and Mason when they may be heard from if they are still living. If any of our readers know of these gentlemen or their heirs we suggest that they be told of the discussion now in progress, so that proper credit may be given where it belongs. Does anyone know whether Stein or Mason actually manufactured fan motors, and if they did what sort of machines they were?

The Patent Office record settles the question as to the original invention of the electric fan motor, but it would be none the less interesting to know who made the first commercial machine. We would like to hear from anyone who thinks he made an electric fan motor between 1854 and the Winter of 1882-3. There must be some one. Let him speak out and gain the laurel ready to be placed upon his massive brow by the countless thousands who formerly suffered from Summer's heat, but do so no longer.

The editor of the *Oval Ledger*, published in Nippenose Valley, Pa., is very anxious to have a trolley road in his town and announces that "If there is any printing or advertising to be done the Ledger will do it free of charge." Considering the business situation that editor is a true patriot.

There should be many important and valuable results from the Niagara Falls electrical project. The company is strongly organized.

OUR BOSTON LETTER.

Preparations are being made for the reopening of the Attleboro, North Attleboro and Wrentham Street Railroad, and it is expected traffic will be resumed about the first of September. The adjourned auction sale of the road by the mortgagees has been set for August 21.

A further extension has been granted the Braintree Street Railway Company of their charter, which expired July 1, and the work of construction will be pushed forward as rapidly as possible. The line is about half finished and will be when completed about four miles in length.

The Gloucester and Rockport Street Railway Company, with a capital of $40,000, has been incorporated to build a railway line from Gloucester across Good Harbor Beach to Brier Neck. The board of directors is composed of B. S. Presson, A. R. Hallowell, F. W. Homans and D. A. White, of Gloucester; W. B. Ferguson, of Malden; A. D. Besson and J. H. Cunningham, of Chelsea.

Johnson & Merritt, formerly sales agents for the Boston incandescent lamp, have removed to Lynn since the business of that company was stopped, and have now secured the New England agency for the well-known Packard lamp, manufactured by the New York and Ohio Company, of Warren, O. They are carrying an unusually large stock of all voltages and candlepowers, and are prepared to fill orders immediately on receipt.

Another disgraceful scene, almost resulting in a riot, was enacted in Bridgeport recently when the Electric Traction Company undertook to lay their crossing over the tracks of the Consolidated road on Main street. The railroad commissioners had granted the necessary permission and the work was started, but was soon blocked by freight trains, lowered gates, live steam and lumps of coal. A lively fight was soon under way, and was only stopped by the appearance of a United States marshal on the scene, an injunction and numerous arrests, after several men were badly injured. The Consolidated road seems to have a first mortgage on this corner of the earth and evidently means to maintain its title in spite of the authorities. These conflicts of authority are altogether too numerous, entirely uncalled for, and should not be tolerated.

The talk of municipal lighting in Cambridge has again been revived, and it looks as though some action would be taken in the matter ere long. The figure set by the Cambridge Electric Light Company at which their plant could be purchased by the city was deemed exorbitant, and for a time the matter rested, but has been again brought up. One outcome of the agitation for municipal ownership of conduits, which originated in Cambridge, and which was pushed so vigorously last Winter, has been to materially delay the placing of wires underground, as the electric light company were advised that it would be unwise to spend a large amount of money for this purpose under existing circumstances, as it would be exceedingly difficult to get it back if the city finally decides to purchase the plant. The city is now paying $1 5 per year for 1,200 candlepower arc lamps, and meters have been put into all the public buildings where incandescent lamps are used, bringing the price considerably above the old monthly rate. The electric light company has had all the best of the argument so far, and it looks as though the city would have to pay the rates demanded or purchase the property at the company's own figure.

Boston, August 11. H. G. T.

A Large Storage Battery Installation for New York City.

The Edison Electric Illuminating Company, of New York, has contracted with the Electric Storage Battery Company, of Philadelphia, for a large storage battery installation, as announced in the ELECTRICAL REVIEW last week. The installation will consist of 150 elements of chloride accumulators, type G, 41 plates, having a capacity of 8,000 ampere hours at 150 volts, at normal rates, or a total capacity of 1,200 kilowatt hours. The installation will be furnished with the most modern and complete appliances for the control and operation of the battery, and everything possible will be done to make it a model, and at the same time the most modern and complete battery plant ever installed. The battery is to be installed immediately, to be ready for the heavy Winter load.

The Lighting Muddle at Detroit.

The feature of Detroit's Council meeting on August 2 was the decision to reject the contract for the Western Electric Company's dynamos for the municipal lighting plant and the order to the Electric Lighting Commission to readvertise. The Lighting Committee had come to the conclusion that they could not carry out their intention not to report on the dynamo contract. They first sent in their report on all other contracts but those for dynamos and lamps. All of these were recommended for confirmation, but on the matter of the dynamos the committee repeated their assertion that they did not think it advisable to confirm the Western Electric Company's contract. The contracts for all material but dynamos and lamps were confirmed.

Underground Wires in Boston.

Commissioner of Wires Murphy, of Boston, will this week issue a statement defining a certain area within which all wires must be underground prior to next January. The following companies have been notified of the Commissioner's intentions: American Bell and New England Telephone Companies, Brookline and Charlestown Gaslight Companies, Boston Electric Company, Boston Electric and Illuminating Company, New England, Western Union, Mutual Union, Postal, Gold and Stock and Financial Telegraph Companies, the Commercial Cable Company and 24 others.

TELEPHONE NEWS AND COMMENT.

The telephone office at Springfield, Ontario, was burned out on August 8.

The Harrison people have established local headquarters in Detroit, Mich., and will soon ask for a franchise.

The Erie Telegraph and Telephone Company has declared a quarterly dividend of one per cent, payable August 20.

Negotiations are on foot to ascertain the feasibility of establishing another telephone exchange in Augusta, Me.

The Montgomery County Telephone Company will extend its line from Gaithersburg, Md., to Rockville, five miles distant.

It is reported that business men at Batavia, N. Y., are to organize a telephone exchange in opposition to the Bell system.

The officers of the Harrison Telephone Company announce that they will begin the erection of their telephone plant in Fostoria, Ohio, this week.

The long-distance telephone line to Portland, Ore., of which 20 miles along the Cowlitz river was destroyed by the floods, has been rebuilt and the line is now working all the way to Spokane, Wash.

The Missouri and Kansas Telephone Company have begun the construction of a new line direct from Kansas City to Ottawa. The present line to Ottawa goes via Paola, a very roundabout and unsatisfactory route.

The principal assessors of Lowell, Mass., have given leave to withdraw to the directors of the Erie Telephone and Telegraph Company on their application for abatement of taxes levied upon them about five years ago.

The new telephone exchange which the ELECTRICAL REVIEW announced last week had been placed in Texas by E. L. Bacon is supplied with magneto instruments, manufactured by the Western Telephone Construction Company, of Chicago.

Grand Rapids, Mich., will soon be connected with other large cities by long-distance telephone. Workmen are stringing a special metallic wire from Detroit and have already reached Ionia. They expect to have the work completed to Grand Rapids by September 1.

The Board of Supervisors, of Kankakee county, Ill., has been asked to grant a franchise to the American Telephone and Telegraph Company to operate a long-distance telephone in that county. The company proposes to run through Momence and have a loop to connect with Kankakee.

The Cleveland Telephone Company, the Northwestern Telephone Exchange Company, and the Southwestern Telegraph and Telephone Company report for the three months ending June 30, 1894, a total surplus of $23,311.11 and 15,508 subscribers, a gain of 51 for the three months.

The New York and Eastern Telegraph and Telephone Company, which was recently granted a franchise by the Brooklyn, N. Y., Board of Aldermen over Mayor Schieren's veto, has been informed by the Corporation Counsel that it must file a $50,000 bond before attempting to do business, and also to assure the city that it will comply with the conditions of the franchise.

Philip Fitzsimmons, a telephone inventor who went to Cincinnati from Birmingham, Ala., nine months ago to put his invention upon the market, has at last succeeded in getting capitalists to take hold of it. James Pettibone, of the Pettibone Manufacturing Company, and R. N. Archer, a lumber dealer, have organized a company with a capital of $100,000. It is said that the manufacture of apparatus will be begun at once.

The Automatic Telephone Company, of Philadelphia, has asked permission to occupy the streets of Lancaster, Pa., with its poles. The officers agree to furnish six telephones to the city, place one in every school building and pay the city two and one-half per cent of the gross earnings for the privilege. The ordinance will be finally considered at the September meeting of councils. It is said the company is entering all the towns of the State.

According to returns filed it cost the American Bell Telephone Company nearly $50,000 to secure the right from the Massachusetts Legislature to increase its capital from $20,000,000 to $50,000,000. The expenses were divided as follows: Hon. John D. Long, Robert M. Morse, J. Otis Wardwell and Robert A. Southworth appeared as counsel throughout the session. The Bell company says that these gentlemen were paid as follows: Hon. John D. Long, $7,500; R. M. Morse, $7,500; J. Otis Wardwell, $7,500; R. A. Southworth, $6,500. The recognized legislative agents received the following sums: Frank J. Ladd, $3,500; George H. Fernald, $2,000; Robert Tarr and M. J. Ferren, $500 each. The company paid to the press of Boston and vicinity more than $13,000 to have the arguments of Hon. John D. Long and R. M. Morse before the committee on mercantile affairs published in full.

American Electrical Works' Clam Bake.

A kind friend has informed us just as we go to press that Mr. Eugene F. Phillips, of Providence, will give his annual clam bake on August 25. As yet we haven't received an invitation, but hope this slight hint will bring it. If not, we shall try again next week.

INCANDESCENT LAMPS: THEIR USE AND ABUSE.

READ BEFORE THE NORTHWESTERN ELECTRICAL ASSOCIATION, ST. PAUL, JULY, 1894, BY A. D. PAGE.

In the present state of the art of incandescent lighting, in no way can central station managers increase the efficiency of their investment more than by careful study of ways and means of operating lamps in a manner which will insure an average maximum light for a minimum expenditure.

Too large a percentage of central stations judge the quality of lamps sold them almost entirely by their life, and even that poor basis of calculation is still further distorted by keeping no ampere records nor averaging results, but judging solely by the individual records of such lamps as may fail in the first hundred hours, or of those which live hundreds of hours past the point, at which, from an economical standpoint, they should have broken. The importance to central station managers of judging lamps which are sold to them from some better basis than individual or even average life, can be better appreciated by referring to diagram No. 1, showing curves of deterioration in candle-power of lamps manufactured by different companies. (In considering deterioration in candle-power, it should be stated that it is a characteristic of every lamp which has yet been manufactured and should be considered entirely independent of blackening or discoloration of the bulb. Lamps may deteriorate to 50 per cent of their initial candle-power within 200 hours and still show scarcely a trace of blackening.) All lamps, the curves of which are shown, were purchased within six months in the open market in lots of from 10 to 25, and the curves are the average result obtained by starting each lamp at the particular voltage which would bring the lamp to exactly three watts per candle, maintaining its voltage constant throughout its life.

Curves Nos. 3, 5 and 6, diagram No. 1, represent the best results obtained from the product of numerous foreign manufacturers. Nos. 4, 8, 9, 10, 11 and 12 each represent a different domestic manufacturer.

While there is no reason to suppose that the average life of lamps shown by Nos. 4 and 7 will be shorter than that of lamps represented by curves Nos. 10, 11 and 12, there is also no certainty that it will be longer, and if a lamp is to be branded as poor by the central station manager, because of the breakage of a small percentage of lamps in the first 100 hours, then the advantage is in favor of the lamp which reached 50 per cent of its original candle-power in the first 200 hours, thus maintaining the carbon at a high degree of incandescence with the necessarily greater strain of the filament for only a few hours.

The carbon which maintains its candle-power must continue to burn at a higher temperature, nearer the point of vaporizing, and is more likely to be destroyed by an abnormal increase in pressure than one which cools within the first few hours to a point where considerable increase in voltage is required to bring it to its initial degree of heat or incandescence.

From the standpoint of the central station, one of the worst guarantees that you could demand from the lamp manufacturer would be an individual life (for each lamp) of 100 or 200 hours. The reason for such demand, when made on your part, arises from the erroneous impression that the lamp which lives only 100 to 200 hours is necessarily defective. Nearly every lamp sold you, and particularly those which show the best results, rises in candle-power for the first few hours (this is not shown in diagram No. 1, as in only one case was the first test after the lamps were started made before the candle-power commenced to drop).

On nearly every central station, particularly on alternating current stations, during light load, the pressure on the primary is abnormally

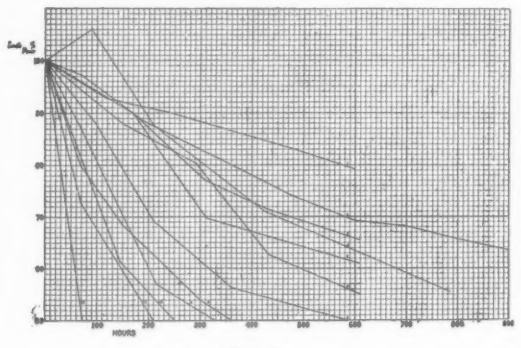


FIG. 1.

high. Add to this the difference between drop in the transformers and secondary wiring, as between full and light load, and the result which a test is quite certain to show is pressure on the one or two lamps which the customer is burning during light load from 6 to 10 per cent high.

Referring to diagram No. 2 we find that burning a new 16 candle-power three and a half watt lamp seven per cent high would, for the first few hours, raise its candle-power to 25, and its efficiency to about 2.6 watts per candle. In less than 150 hours, even maintaining the high pressure mentioned, the candle-power and efficiency would fall below normal; but in the meantime, the new lamps which have been burned under the above conditions have been abused to an extent which would be quite certain to make the showing of some individual lamps very poor, *through no fault of the lamps.*

After lamps have been in use about 200 hours, under average conditions, they could then be used where the pressure was high, without bringing the carbon to a dangerous degree of incandescense.

One of the best illustrations I can give of the importance of your judging lamps from some better standard than simply life, is to refer to an incident of which I had reliable information where a representative of the lamp company, who manufactured the lamps shown by curve No. 12, diagram No. 1, exhibited the valuable quality possessed by his lamp standing very high pressure. With a rheostat it was exhibited burning from normal to a very high candle-power. He represented it as the *toughest* filament ever placed in a lamp, and I have no cause to disbelieve him.

If central stations run with a variation of from 6 to 20 per cent in pressure they will find it necessary to demand *tough* lamps, the natural product of the *amateur* lamp manufacturer. To bring a product up, however, even from curves Nos. 9, 10 and 11 to No. 4, means experience and thousands of dollars spent in experiments.

It also means that each one of over

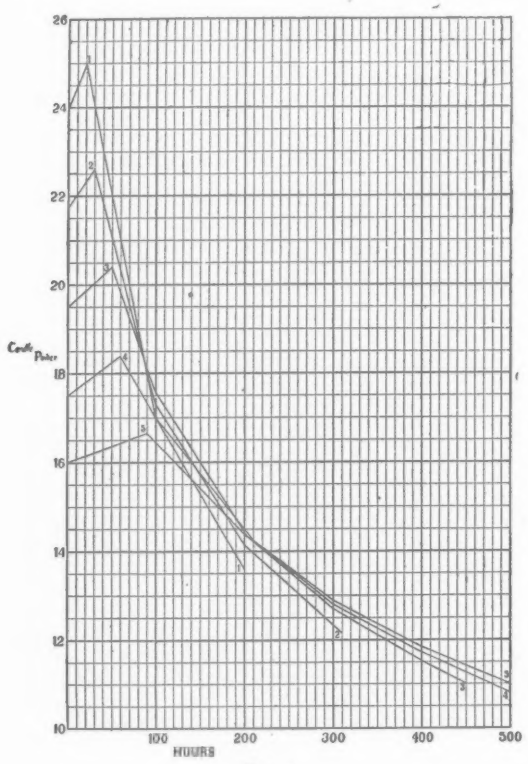


FIG. 2.

50 different operations through which the parts of a lamp pass from start to finish, should receive careful, intelligent handling or direction. Perfection in any one particular will not attain even average results.

The manufacturer of lamps shown by curve No. 4 might have furnished the same carbons to manufacturers of lamps represented by curves Nos. 10 and 11, and the result which they would obtain would not differ materially from that secured with their own make of carbons. Curve No. 4, though it represents as high an average grade of lamp of any voltage above 100 as has yet been furnished to the customers of any lamp manufacturer, does not represent the highest point which will be attained.

Curves Nos. 1 and 2 represent experimental lamps manufactured and furnished for test by the same company, whose regular product is represented by curve No. 4, and I am informed by reliable experts that within a few months the entire product of the company will be brought up to the standard represented by curve No. 1.

That the relative value of the lamps represented by these curves may be fully appreciated, let us take the average candle-power of curve No. 1, diagram No. 1, which for 600 hours is 14–19 candles, and we find, to maintain the same average candle-power, using other lamps, we should have to break lamps represented by curve No. 4 at 530 hours; No. 7 at 170 hours; No. 8 at 100 hours; No. 9 at 120 hours; No. 10 at 90 hours; No. 11 at 75 hours, and No. 12 at 35 hours.

All of the lamps represented by diagram No. 1 are of voltages from 100 to 125 volts, and though started at a higher economy (*vs.* three watts per candle) than is commonly practiced by central stations (the 3.1 standard of Edison illuminating companies being the highest of which I have personal knowledge). Testing at three watts comes nearer to results obtained by commercial practice than a lower initial economy, as the tendency of the average central station is to run high.

Diagram No. 3 represents lamps of from 50 to 60 volts, started at three watts per candle, and tested under the same conditions as the 100 to 120 volt lamps.

No. 1 is the product of the same factory as Nos. 1, 2 and 4, diagram No. 1.

No. 2 was manufactured by the same company as No. 9.

No. 3 was manufactured by the same company as No. 11.

No. 4 was manufactured by the same company as No. 10.

As proven by these curves, and also, I believe, as generally acknowledged, it is much easier to produce a fairly good 50 volt lamp than one of a voltage above 100; but, considering the progress which has been made within the past year in the high-volt lamps, I believe that in a short time a large percentage of alternating current central stations will find it to their advantage to use large transformers and secondary mains on the three wire system, covering one or more blocks from one transformer or bank of transformers and using only lamps of over 100 volts, thus greatly economizing in copper and securing much better regulation than is now secured with numerous small transformers and 50 volts on the secondary.

The importance of good regulation or a constant voltage at the lamps is too little appreciated, the general opinion of central station managers apparently being that so long as the life of the lamp is satisfactory to themselves or their customers, if they increase the voltage either temporarily or permanently, the result would be to increase the average light. The facts are that burning lamps above their normal rating decreases the entire average candle-power on the customers' circuits and, at the same time, if the station is on a meter basis, increasing the amount of the customers' bills. The above statement is particularly true of lamps only of average quality.

Referring to diagram No. 2, No. 5 curve represents a 108 volt, 16 candle-power, three and one-half watt lamp burned at a constant voltage and

reaching 11 candles at 500 hours, starting the same lamp at 110 volts or at 17½ candles, 3.3 watts per candle, and inside of 200 hours the candle-power curve crosses the one burned at normal. Starting it at 112 volts or at 19½ candles, 3.1 watts per candle, in less than 200 hours the candle-power curve crosses both the others.

Curves Nos. 1 and 2 follow the same general law. The higher we raise the voltage the more rapid the drop in candle-power, and when we consider that the lamp represented by curve No. 1 *must be kept at* 116 *volts* in order to give 14 candles of light after 200 hours, and that should the voltage be brought back to normal, or 108 volts, the candle-power would be only about nine candles, we can appreciate that on a station where the voltage varies even seven per cent, the result must be a very uneven and poor quality of light, even though the *life* of the lamp is satisfactory.

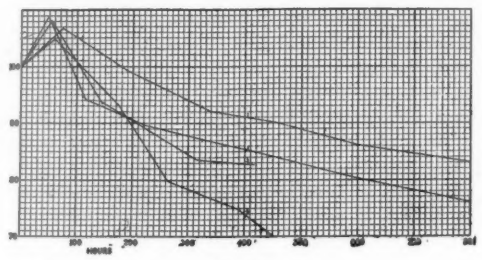


FIG. 3.

The tendency of all central stations seems to have been to gradually raise their voltage with the intention of thus either burning out or increasing the candle-power of the old lamps on their circuits. The result is only to either burn out an abnormal number of new lamps or bring them down to the candle-power level of the old ones within 200 hours.

The only practical method of keeping the average candle-power of lamps on a station at a point which will be satisfactory to customers or on a competitive basis with other methods of lighting, is to keep records of the average life on the entire station where free renewals are furnished, and then to take out of the sockets and break up all lamps which are dim, by this means keeping down the average life to whatever constant is decided as the best under local conditions. Where lamps are sold to the customers, to keep the candle-power of lamps in use on the circuit of a central station at a point which will insure satisfaction or tend to keep the electric light popular, is a difficult problem. Whether the customer is on a meter or on a contract basis, it is poor economy for him to keep lamps in his sockets which are giving only 50 per cent of their initial candle-power, but for the corporation which sold him the lamps and supply him with current, to call his attention to the fact that lamps in his sockets are giving only about eight candles, and attempt to sell him lamps at 50 or 60 cents each, is not likely to bring about the desired result. To meet the above difficulties a number of central stations in different parts of the country are now selling lamps at retail to their customers at cost and a few stations even below cost, at the same time doing all in their power to prove to them that only by a liberal use of lamps can they obtain the greatest amount of light for a given expenditure of money.

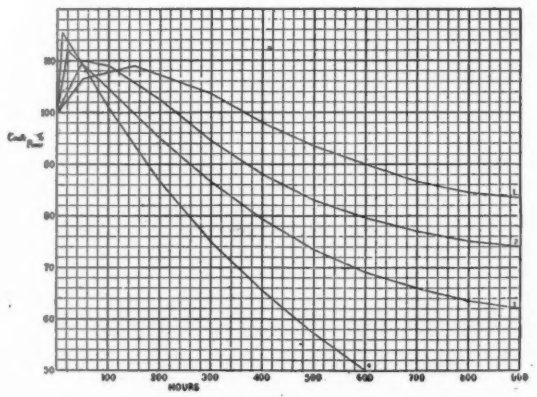


FIG. 4.

As the profit on the sale of lamps is decidedly a secondary matter as compared to the sale of current and the increased quality of the light, the above plan should commend itself to all central stations not on the basis of furnishing free renewals. It is also worthy of consideration that by adopting the above plan the station controls what lamps shall be used on its circuits without dictating to its customers, an important point, while lamps show such widely different results as those shown by diagram No. 1. And while customers continue more likely to believe that the corporation is not supplying proper current, than to believe that the quality of lamps they have been purchasing is at fault.

Another method of inducing customers to destroy dim lamps, which has found favor with a number of stations, is to make a price for lamps of, say, 40 cents each and agreeing with their customers to exchange all dim lamps (which they have sold them) at half price, that is, for every dim lamp which the customer returns before the carbon is burned out, he receives a new lamp for 20 cents.

Within the past few months the question has often been asked me by central station managers: "What economy of lamps should we use?" This question should, I believe, be settled by central station managers themselves on presentation of facts, they having control of the regulation of their station and knowledge of local conditions.

Diagram No. 4 shows the same quality of lamp manufacture as curve No. 2, diagram No. 1, and represents 16 candle-power lamps started at an initial economy of four, three and a half, three and two and a half watts per candle. The accompanying table shows candle-power, average candle-power, average economy and average candles per electrical horse-power at 100 hour periods in their life.

In considering these curves and table it should be remembered that the result would have been much less favorable to the higher economy lamps had the test been made and the curves plotted with a poorer quality of lamp, and also that satisfactory results with lamps of higher economy than three and one-half watts per candle can only be obtained by exercising the greatest care in maintaining a constant voltage at the lamps. Referring to the table briefly, it will be found that even at 600 hours, lamps of the highest initial economy show the best average result as to average watts per candle and average candles per horse-power. And that at 900 hours three watt lamps show better average results than lamps of 3.6 or four watts. The greatest objection which can be urged against the high economy lamp is that while at 900 hours the four watt lamp reaches a minimum candle-power of 13¼ candles and the three and one-half watt lamp about 12 candles, the three watt lamp reaches 10 candles and the two and one-half watt lamp at 600 hours reaches eight candles. At the present price of lamps, where fuel is high and the customers' bills are made up on the basis of lamp hours, it would, without question, pay the station to use high economy lamps, breaking them at a point which would insure satisfaction as to average light and keeping the average life comparatively short.

		64 Watts	56 Watts	48 Watts	40 Watts
100 Hours	C.P.	17.28	17.44	16 8	16 16
	Average C.P.	16.8	17.06	17 09	16.96
	Average Watts Per Candle	3.9	3.28	2 8	2 36
	Candles Per El.H.P.	191	227	266	316
200 Hours	C.P.	17.12	16.32	15 2	14.08
	Average C.P.	17.03	16.94	16 51	15 97
	Average Watts Per Candle	3 76	3.3	2.9	2.5
	Candles Per El. H.P.	198	226	257	298
300 Hours	C.P.	16 64	15.04	13 92	12
	Average C.P.	16.96	16.53	15.86	14.96
	Average Watts Per Candle	3.77	3.39	3.03	2 67
	Candles Per El.H.P.	198	220	246	279
400 Hours	C.P.	15.68	14.08	12.8	10.56
	Average C.P.	16 74	16.	15.2	14.03
	Average Watts Per Candle	3.82	3.5	3 16	2.85
	Candles Per El.H.P.	195	213	236	262
500 Hours		15	13.28	11.68	9.12
		16.45	15.57	14.62	13.2
		3.89	3.59	3.28	3.03
		192	208	227	246
600 Hours		14.40	12.8	11.04	8.
		16.	15.15	14.08	12.43
		4	3.7	3.41	3.22
		187	202	210	232
700 Hours		13.92	12.32	10.56	
		15.84	14.78	13.63	
		4.04	3.79	3 52	
		185	197	212	
800 Hours		13.6	12	10.24	
		15.6	14.45	13.23	
		4.1	3.88	3.62	
		182	192	206	
900 Hours		13.28	11.84	9.92	
		15.36	14.18	12.88	
		4.17	3.94	3.73	
		179	189	200	

TABLE.

Whatever economy or make of lamp you decide to use, by no means can you so greatly increase the efficiency of your station as by making every possible effort in the direction of maintaining a constant voltage at the lamps. This can only be accomplished and maintained by constant use of reliable, portable instruments. No switchboard instrument should be relied on, without often checking it by some reliable standard, and it should also be borne in mind that, owing to the varying drop at various loads, constant voltage *at the station* is just what is not wanted. If you do not possess a reliable, portable voltmeter, such an instrument should be your next purchase; then by constant use on your circuits at different loads and *profiting by the knowledge thus obtained*, you would soon find a marked improvement in your lighting, and would be in a position to judge which make and what economy of lamp is the best for you to purchase.

Leather Belting.

A PRACTICAL MAN GIVES SOME HINTS ON THE PROPER CARE OF PRINTING OFFICE BELTS.

TO THE EDITOR OF ELECTRICAL REVIEW:

The small piece of goods hanging up there is silk waste and non-combustible. It was put there trailing on the belt to prevent the accumulation of dust. An accumulation of dust on the outside of a belt will absorb that moisture which is required to insure a good pull.

I have found in 18 years experience that a good belt is what is wanted on a printing press, and when you get one take care of it. It is not very hard to keep a belt in good shape.

Don't allow resin, balsam of fir, soap, or any other substance of a sticky nature to be used on the belt at any time.

Keep the parallel belts free from dust. This can be done by cutting a piece of canvas or silk waste long enough to just touch the belt when running on the small cone (if for cone pulleys). This will give a little longer trail when the belt is thrown on the large cone; goods should be the width of three cones at least. About once a month use a damp sponge on both sides of all dry belts, and apply some good belt dressing, of which there are several in the market. The "up and down" belts in our business don't get a chance to dry up, but we have another great enemy to contend with, oil. I find that the oil must be stopped from flowing that way first; dry out the belt thoroughly by using a little wood alcohol, and allow the belt to dry half an hour or so; then apply a little of the dressing to the outside of the belt, and in a very short time the belt is down to solid work.

Of course it is understood by men handling belting that a nicely laced belt is the proper thing. A belt not too short with a graceful slope on the idle side is doing the work, while one swappy and tight will soon tear out holes and make hot journals; also a snakey belt. H.

New York, July 28.

THE GERMAN PATENT SYSTEM.

INTERESTING REPORT TO THE COMMISSIONER OF PATENTS BY EXAMINER BISSING, OF THE UNITED STATES PATENT OFFICE —THE GERMAN SYSTEM COMPARED WITH OUR OWN.

BY GUSTAV BISSING.

(Continued from page 65.)

THE OFFICE AND THE COURTS.

In its relation to the courts the German Patent Office occupies a most unique position. According to the law, the decision of the German Office is final, and the courts have nothing to do but interpret and carry out its decrees. When the Patent Office issues a patent there is nothing left for the courts but to enforce it. If a patent has been granted to A, and B makes an infringing device and is sued by A, B cannot urge the invalidity of A's patent before the court. He may have a prior reference which is a picture of A's patent, but the court must nevertheless accept the patent as valid until the Patent Office, by a proper proceeding, has declared it invalid. The court will, however, suspend proceedings until the injured party can make a motion at the Patent Office to have the patent declared invalid by reason of the prior art, whereupon the Patent Office will consider the matter in a so-called annulment proceeding. The Patent Office can then decide to annul or limit the patent, or it can decide to let the patent stand intact. In any case the court is bound by its decision.

Nevertheless the court is bound to interpret the patent, which means that it is bound to ascertain precisely what the Patent Office intended to protect, and in interpreting the same it considers the prior art, the judgment of technical experts who are called in for the occasion by the court, and the judgment of the Patent Office, which is given when required. These things are, however, merely considered in order to arrive at the intention of the Patent Office, it being assumed that the Office was familiar with the art, and that if the claims of the patent are capable of a construction by which they cover something which is old, that this is not the construction which the Office intended to give the claims; that is, the courts will not convict the Office of an absurdity by giving a claim a construction by which it would cover old and unpatentable subject matter. Nevertheless it is categorically asserted by the legal members of the Patent Office, who certainly were in a position to know, that if a patent on its face is capable of but one construction, and the claims unequivocally cover a certain thing, the court has no right to go back of the face of the instrument, even though it may consider that the claims should have covered less than they really were made to cover, the sole remedy for this state of facts being to send the patent back to the Patent Office for revision and reconstruction; that is to say, as a matter of law, the Patent Office is final in its judgment of what an inventor may cover, and the only thing for the courts to do is to decide whether an infringing device really falls within the terms of the patent.

It is needless to say that this state of facts has appeared to make the courts somewhat restive, but this has not been in the direction of desiring to limit patents which the Patent Office has made too broad, but, on the contrary, to broaden patents which the Patent Office has unduly limited. Thus, for instance, the German Patent Office insists upon limitations being inserted in claims in the shape of new elements, if in their opinion the state of the art requires it. The Supreme Court has, however, decided that if they find that one element of a claim is new, they may construe the claim to be for that one new element and disregard the other old elements and sustain the patent broadly for the one new element, although on its face the claim is limited to the combination of six or seven elements. Here is an evident conflict of authority which must be removed in some way and upon which the officials of the German Patent Office are now engaged.

CONTRAST WITH OUR SYSTEM.

The contrast between the German Office and our own in this respect is indeed remarkable. We have always been extremely careful, and the courts of late have been extremely strict. On the other hand, our authority is merely to give a *prima facie* title, and the courts have absolute power to enforce the grant or restrict and annul it as they see fit. In Germany the Patent Office is extremely severe and the courts are liberal. The Patent Office has absolute authority to give a conclusive title, and the courts have no power, legally speaking, to restrict or annul it. The reason why the German courts have thus broadened the construction of patents by disregarding certain elements in the claims which did not add to their novelty is confessedly due to the great strictness of the German examiners and to the fact that useless and senseless limitations have frequently been imposed on applicants which would in fact, as the court has said, make most patents valueless if adhered to.

CHANGE IN LAWS.

Another point of interest lies in the fact that it is very easy to bring about a change in the German patent laws. If such changes are regarded as desirable by the Patent Office officials, their recommendations for what is needed are invariably adopted. Considering that Germany is a monarchy, this facility for changing their patent laws reflects rather severely upon our own institutions, in which an amendment of law seems almost impossible to bring about, even though it is regarded as desirable. This is partly at least due to the fact that the Germans as a people have recognized the great importance of their patent system and its tremendous utility in developing their arts and sciences. It seems rather hard that we in the United States, who owe fully one-half of our prosperity in manufacturing pursuits to our patent system, which has been a model for other nations to copy, should be fettered by carping criticism and unfair opposition on the part of those who do not appreciate its benefits.

It may here be stated that the German public is in favor of keeping with the Patent Office all the authority which it has at present; and in case any further sub-divison of authority is necessary between the Patent Office and the courts, to relegate the same to the Patent Office and not to the courts so as to make the office the final arbiter of all patent matters. The reason for doing this is that the Patent Office is supposed to have a special corps of men trained for their special work, and that their decisions are, therefore, more likely to be correct than those of a judge who has little knowledge of technical questions. Here again we come upon an important difference between the American and German systems, and before any steps are taken, if ever such steps should be contemplated, of stripping the United States Patent Office of any more authority in the matter of granting patents, it might be well to look into the German system and the reasons therefor.

ANNULMENT.

Coming now to the proceedings for annulling patents, we find these in charge of a board consisting of the president of the Patent Office, a legal adviser and three technical men selected from a number who are especially employed for that purpose and constitute part of the staff of the Office. The proceedings are in secret and each party is represented by attorneys. The arguments are made pro and con, the attorneys leave the room, and when the matter is provisionally decided the attorneys are informed of the decision and this is afterwards written out at length. An appeal from the decision lies to the Supreme Court of the empire. Here again I noticed the difference between the actions of the technical men and of the lawyers. The lawyers carefully analyzed the claims, picked out the essential from the inessential, interpreted and criticised in a manner of which any of our federal judges might well be proud. The technical men either seem to overlook striking differences or else did not lay the stress on them which their importance demanded. Fortunately, however, as there were two lawyers and only three technical men, instead of one lawyer and 12 technical men, as in the examining boards, the opinion of the lawyers was given greater weight, both by reason of their number and of their greater power of didactic reasoning, and the decisions in the two cases at which I was present seemed to me to be about correct according to our American notions, although their text was somewhat strained and unduly technical in matter of law. One of the reasons for which a patent may be declared invalid in Germany is that the same has not been put into use within a given time or that its use has been refused to those willing to pay a reasonable price. Such matters are decided by the annulment tribunal.

PROMPTNESS.

The German Office requires great promptness in the amendment of all applications. A limit is set by the Office in each case, which limit is very short, in fact, unduly so, and if the applicant does not reply within the given time his application is considered abandoned. As to the number of claims, it may be said that but one claim is in effect allowed. If a second claim be granted it is limited to everything set out in the first claim plus certain additional limitations. Nevertheless, even though the first claim is held to be allowable, the Patent Office does not as a matter of course allow a second claim with an added limitation, for the reason that the Supreme Court may construe this second limitation to be merely for the element added to the first claim and may, therefore, disregard the limitations in the first claim. This is another sample of the conflict which at present exists between the Office and the courts, and which certainly will have to be removed.

SEARCH.

Coming now to the field of search, we find that the classification is, broadly speaking, very similar to our own, which was to have been expected, since both classifications are founded upon the arts as they exist in practice. Complete copies of all German patents divided and sub-divided are kept by each examiner from which to make his search. As the Office is young, there are some examiners who have carried this classification of their German patents a great deal further than others. For instance, the classification in metallurgy and paper making is quite as fine as in our Office, corresponding very closely to it in fact. Some arts, however, exist with no extended sub-division.

The foreign patents, comprising English and United States patents mainly, are searched from the abstracts which are cut from our Official Gazette and from the Official Gazette of the English Patent Office. Is it needless to say that this makes the German search far less accurate than our own. First of all, we have 10 United States patents to every one patent which Germany has granted, and we search these patents by a full photolithograph of all of the sheets of drawings comprising the patent. The German Office merely takes the little slips cut from our gazette. Again, they have not had time to subdivide these United States clippings, except in the most general way, the sub-division in case of their foreign patents not being nearly so extensive as that in the case of their own German patents. Taking, for instance, the United States patents for arc lamps, which we search from the original photolithographs, sub-divided into some 10 sub-classes, the German examiner has to search from the little clippings of one or two figures on a very much reduced scale, without any description alongside of it, except such as is contained in the claims, and in order to make a search on any feature he has to go through every patent on arc lamps, instead of going through one-tenth of such patents as with us. The same is true of all the electrical arts, in so far as their foreign patents are concerned, and I believe the same is true of all their other arts.

As to the periodical literature, a few of the examiners have cut out and classified all that is to be found therein appertaining to their subject. This, for instance, has been done by the examiner of paper making. But this is rather the exception than the rule, and although our United States Office has not been able for the last 10 years to keep up classifying the periodical literature and getting the appropriate references put away in boxes with the appropriate patents, yet the results of work which was done more than 10 years ago in this direction still leaves us ahead of the German Office.

It follows then that the American search is far more accurate than that of Germany. Having very courteously been accorded the permission to examine a number of pending cases in my own art, and having selected a number of applications which have been before me in an official way in this country, I found that in several cases but few of the references which we had cited and relied on had been found. Taking the case of a push button, for instance, which the examiner had rejected on a reference which he admitted upon discussion with me was inapplicable, I referred him to a reference which was certainly infinitely nearer in construction and which in his judgment anticipated the entire application. In an application for cable telegraphy, new in itself but old in parts, the German Office had failed to develop some five or six patents which had been developed in our search and which were admittedly important. This leads me to the conclusion above mentioned, that if the Germans will send their applications to us to be searched they might close their office for six months in the year, for they certainly would grant very few if any patents in view of the references which we are accustomed to cite. It is a matter of interest, however, that the kingdom of Luxumborg has implicit confidence in the German system of search, for although the country is too small to

have an examining corps of its own, it allows applicants to file applications which receive validity only in case the German Government grants a German patent for the same thing. Possibly our Canadian friends might find this of interest.

(To be continued.)

Underground Wires in Baltimore.

The Municipal Subway Commission, of Baltimore, is composed of Mayor Latrobe, Register Robb and Frederick Preston, and was appointed some time ago to devise means of having the wires of the city placed underground. The City Council appropriated the sum of $250,000 to carry out the work last March, and $100,000 of it is available at present. The commission is now discussing the plans submitted by Engineer Hill, who was employed by the commission.

Mr. Hill was seen at his office by a reporter, and said: "As far as I am concerned, the plans have reached a point very near completion. The primary object has been to so arrange the subways so that, in case an accident should occur at any time, it will affect the least area and at the same time bring it about at the least expense. All that now remains is for these lines, as I have prepared them, to be measured up and final estimates made upon them."

A large map occupies nearly all of one side of Hill's office in the Equitable building, and on that the system was portrayed in the minutest detail. Supposing the city to be a circle with the city hall as a center, the lines will start from that point, reaching out to the circumference, and will return in nearly parallel lines.

When the city granted a charter to the Chesapeake and Potomac Telephone Company to construct subways, the right was reserved by the city to, at any future time seen fit, use a certain space in those subways for its own wires. These subways have been utilized to the utmost extent. They are centralized near the city hall and extend in all directions.

It is probable that the commission will accept the estimate offered, and that work will begin some time in the near future upon the project. Engineer Hill said that he was unable to place any estimate upon the probable cost of the work.

Complete Portable Testing Sets.

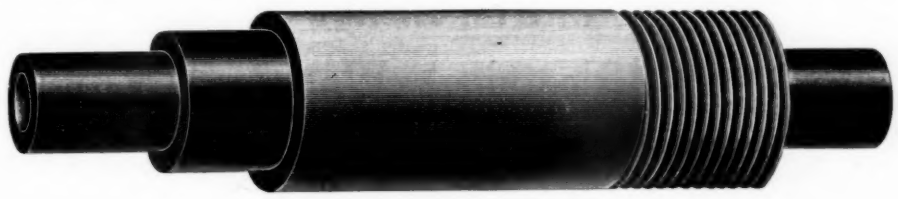
Queen & Company, Incorporated, of Philadelphia, have a wide reputation for resistance boxes of standard quality, and in this relation their portable testing sets deserve special notice. For some years past they have manufactured such apparatus, comprising Wheatstone bridge, rheostat and galvanometer, and in 1891 filled a long felt want by substituting a D'Arsonval galvanometer for the type with fibre suspension which had been used prior to that time. By means of the new form measurements could be made close to dynamos and on ship board or other places, subject to vibration and where earlier apparatus could not be used at all.

Last year recognizing the desirability of extreme compactness, Queen & Company redesigned their series of testing sets and produced the "Acme" form which is very favorably known. It is the smallest and most complete instrument of its class made anywhere in the world, and contains a Wheatstone bridge with reversible arms, rheostat, D'Arsonval galvanometer, double contact key and also a silver chloride battery. The latter is sufficient for all resistances up to 200,000 ohms, so that for work below this limit the instrument is self-contained. The coils are wound with platinoid wire, calibrated to a guaranteed accuracy within one-fifth of one per cent and the galvanometer is of the highly favored D'Arsonval form. This set has been approved by the United States Government for marine service, and received the highest World's Fair award. During the past two weeks the orders for testing sets received by Queen & Company have materially increased, so that this may indicate something of a revival in general business.

It may be interesting to note that the above makers received the only award at Chicago for "testing sets and standard resistances." Circular No. 520 contains information of value to every one interested in making resistance measurements, and will be sent by Queen & Company on application.

Telescopic Iron Armored Insulating Conduit for Underground Work.

The telescopic insulating conduit with an iron armor, illustrated herewith, is the latest addition to the underground conduit system of the Interior Conduit and Insulation Company, of New York. The telescopic arrangement, whereby lengths of plain insulating conduit are slipped into lengths of the iron armored insulating conduit so that the sections break in the centers of the lengths, gives a double insulation, and at the same time an iron armor for protection.



TELESCOPIC IRON ARMORED INSULATING CONDUIT.

The lengths are coupled together by straight threading the ends, and abutting them in the center of the coupling, thus producing an underground conduit that is thoroughly waterproof, lasting and possessing the highest insulating qualities, so high in fact that it is claimed that bare wires can be drawn in with the certainty of perfect results. This system is complete in details, including junction boxes, etc., and is now in actual use in the underground construction of the Johnson-Lundell electric railway at East Sixty-ninth street and First avenue, New York.

LITERARY.

H. L. Webb, who has had experience as an electrician in many countries, contributes to the September *Scribner* a short story with a very original motive. The action takes place in a lonely cable house at the end of one of the cables in an obscure South American port.

"A History of the United States" by Prof. Allen C. Thomas, A. M., has been received from D. C. Heath & Company, Boston. The aim of the work is to give the main facts of the history of the United States clearly, accurately and impartially. Considerable space is given to the interesting and important era beginning with 1789. The illustrations are suitable and authentic and the typography excellent. The price of the book is $1.25.

"What do the newspapers say about it?" is the thing everybody wants to know when an important political question comes up. The busy man especially feels the need of a journal that will give him the briefest possible compass, and with uniform fairness, extracts from the leading newspapers of all parts of the country, and of all political shades. Fortunately, one such journal is to be had—just one. For example, when everybody was eager to know what the press of the country had to say about President Cleveland's tariff letter, *Public Opinion* gave in the space of four pages no less than 76 separate and distinct extracts from as many prominent newspapers, North, South, East and West. No other journal in the world furnishes its readers such comprehensive symposiums of editorial comment on current topics. Nor is this all. Besides these four pages of editorial comment on the President's letter, the same issue of *Public Opinion* contained 22 pages of other matter, including nearly 100 extracts from newspaper editorials, nearly 20 condensed magazine articles on the leading topics of the day, Congressional news, condensed summaries of the general news of the week, American and foreign, etc.

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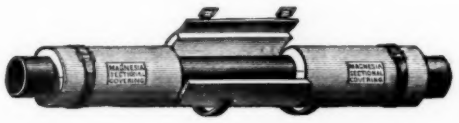
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KINDRED INTERESTS

The Berlin Iron Bridge Company, of East Berlin, Conn., are furnishing the iron roof for the new boiler and dynamo room for the Larchmont Electric Company, at Mamaroneck, N. Y.

J. H. Bunnell & Company, 76 Cortland street, New York, have issued a new catalogue of electric railway supplies which contains about everything required in the construction of a trolley road. There are several meritorious and low-priced specialties mentioned which electric railway managers should know about.

The National Conduit Manufacturing Company, of New York, seem to be doing a large part of the underground work in this country and Canada this year. They have just closed a contract with the Boston Electric Light Company, of Boston, for all their subway work this year; they have also contracted with the Nebraska Telephone Company for all the conduits for the Lincoln subway which is to be built this year.

Chas. A. Schieren & Company, New York, report a slight improvement in business. They have recently shipped a 48 inch three-ply belt and some other belts to the Capital City Gas and Electric Company, Des Moines, Ia., and are making four 36 inch double belts for the Union Light and Power Company, Nashville, Tenn. They are also furnishing to the Citizens' Electric Illuminating Company, Brooklyn, N. Y., two 46 inch three-ply belts, each about 110 feet long, and 24 dynamo belts.

The Garlock Packing Company.—In 1883 Mr. O. J. Garlock, whose occupation at that time was chief engineer for the firm of Bartle & Eames, invented a packing and after many successful experiments, applied for, and was granted, letters patent for the United States and Canada. Being a practical engineer he fully understood what was wanted in the way of a packing for steam, water and ammonia. The business was commenced in a small way without capital; and the continued increase made it necessary to secure facilities for properly conducting it. The members of the firm constituting the Garlock Packing Company at present are: O. J. Garlock, E. Nichols and F. W. Griffith, as organized in 1887. Since that time the business has developed with phenomenal rapidity. This company now manufacture their packings in Palmyra, N. Y., and Rome, Ga.; and also have extensive offices and warerooms in New York, Philadelphia, Pittsburgh, St. Louis, Omaha and Chicago. It may be interesting to our readers to know that their business, notwithstanding the hard times, was nearly double in 1893 over the previous year.

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